3.1.4 Journal Proving The Pythagorean Theorem Name: Isaiah Singh
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**Scenario: Will the TV Fit?**
Instructions:

- View the video found on page 1 of this Journal activity.
- Using the information provided in the video, answer the questions below.
- Show your work for all calculations

1.

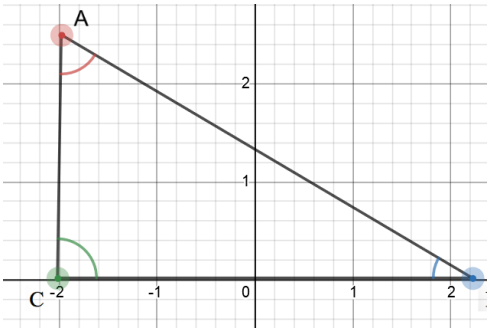
**The Students' Conjectures (3 points: 1 point each)**

*What conjecture is being made?* **Answer: They could fit the TV in diagonally.**

*What key details are given?* **Answer: The trunk is 26 inches high and 50 inches wide.**

*How will you determine if the conjecture is true?* **Answer: Set up some similar triangles, and use those similar triangles find out how long the trunk diagonal is.**

2. Determine if the TV will fit in the car.
a. Draw the rectangle that represents the height and width of the trunk including the diagonal. Label the dimensions on your sketch. (**1 point**)




26 inches high

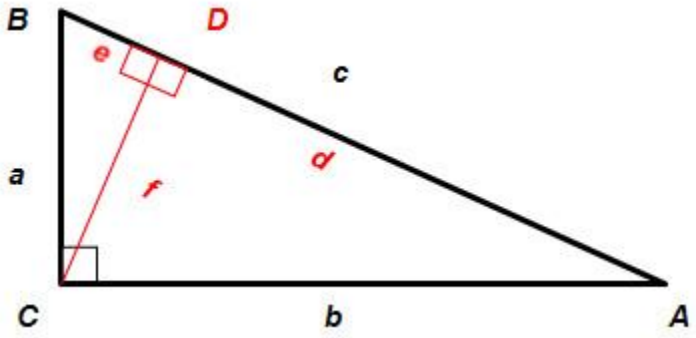
50 inches wide

b. Use the Pythagorean theorem to calculate the length of the diagonal. (**2 points**)
**Answer: C= 56.36**

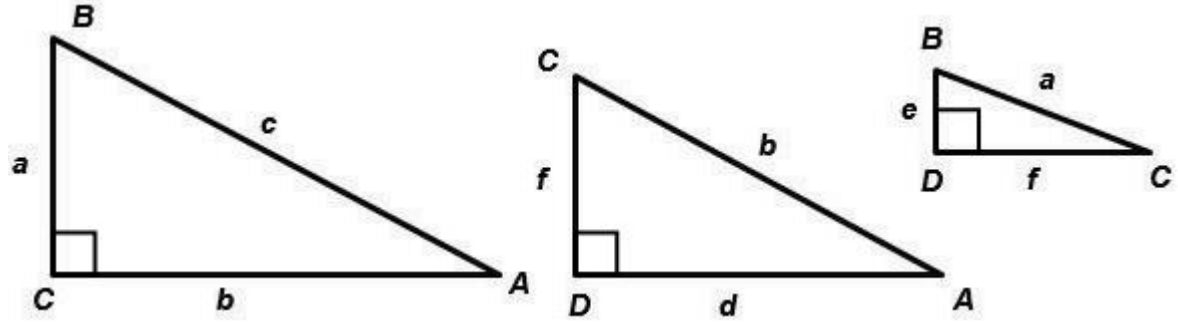
**Work: $26^2+50^2=56.36^2$ 676=2500=3176**

c. Assuming the trunk is at least 96 inches deep, can the TV fit into the trunk of the car? Explain your answer. (**1 point**)
**Answer: No. C (diagonal) is too long. The number of inches that is required for diagonal is 54 inches. The TV is 56 inches is 2 inches too long and won't work.**

3. The Similar Triangle Method (**9 points total**)
To prove that the Pythagorean theorem works, leave out the dimensions and represent the trunk of the car with a right triangle *ABC*.
Drawing an altitude from vertex *C* to side *c* creates two new triangles, *BCD* and *ACD* (see diagram).




a. Here are the three triangles shown separately These triangles are similar. How do you know? HINT: Compare the angle measures. (**1 point**)




**Answer: They all have a right triangle, and they have the same shape.**

b. Complete the proportion to compare the first two triangles. (**1 point**)
b/d

$$\frac{b}{c} = \frac{\square}{\square}$$

c. Cross-multiply the ratios in part b to get a simplified equation. (**1 point**)

**Answer: b(d) c(b)**

d. Complete the proportion to compare the first and third triangles. (**1 point**)

$\frac{c}{a} = \frac{\square}{\square}$ **Answer: d/e**

e. Cross multiply the ratios in part d to get a simplified equation. (**1 point**)

**Answer: d(c) a(e)**

f. Complete the steps to add the equations from parts c and e. This will make one side of the Pythagorean theorem. (**1 point**)

Part c : $b^2 =$ _____ **Answer: c**

Part e : $a^2 =$ _____ **Answer: b**

$a^2 + b^2 =$ _____ **Answer: $cb^2$**

g. Factor out a common factor from part f. (**1 point**)

$a^2 + b^2 =$ ___ ( ___+ ___ )

h. Finally, replace the expression inside the parentheses with one variable and then simplify the equation to a familiar form. HINT: Look at the large triangle at the top of this problem. (**2 points**)

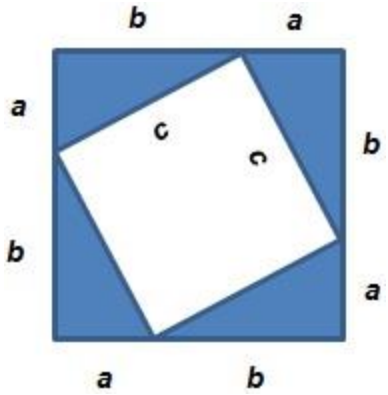
$a^2 + b^2 =$ ___( ___ ) **Answer: $c^3 + b^2$**

$a^2 + b^2 =$ ___ **Answer: $c^3 + a$**

**Further Exploration**

4. A Geometric Proof (**4 points total**)

Here is another interesting proof. The smaller white square is inside a larger square. Each blue area is a right triangle. To find the area of the white square, you can find the area of the big square and subtract the areas of the right triangles.




Area of big square = $(a+b)^2$

Area of 4 triangles = $4\left(\frac{1}{2}ab\right)$

Area of white square = big square – 4 shaded triangles

a. Use these areas to write an equation for the area of the white square. Simplify the equation if possible. (**2 points**)

Answer:
**Area of square = (a+b)^2**
**Area of 4 triangles= 4(1/2 ab)**

**Area of white square = (a+b)^2 - 4(1/2 ab**

**Or area of white square= (a+b)^2 - 2ab**

**Or area of white square= a^2 + b^2 +2 ab - 2ab**
**Or area of white square= a^2 + b^2**

**Thus the simplified expression is**
**a^2 + b^2**

b. Compare the similar triangle proof from question 3 with the inscribed square proof. How are they different? Which method was easier for you to understand? (**1 point**)

**Answer: The method easier to understand is the one with the Pythagorean Theorem.**

c. Are there any other considerations that should be taken into account when trying to fit a giant TV into your car? (**1 point**)
**Answer: Yes, the size of your motor vehicle, the size of the television.**